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"Black-rush"—A Form of Winter Trichostrongylosis in Northumberland

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GENERAL.—Numerous outbreaks of a fatal diarrhoea have been reported in young sheep (hoggs) during the past two winters. Under the names of "black-rush" or "black scours" the disease is well-known and is regarded by flockmasters as an almost specific, seasonal malady; reports indicate that recently it has become more widespread and frequently causes very heavy losses. The incidence of black-rush is probably connected with the succession of severe winters and with the prevailing difficulty in obtaining suitable alternative wintering for this class of sheep. Unless conditions are specially favourable, most hoggs wintered at home on rough or semi-rough grazings lose a considerable amount of weight, and many become weak and offer but feeble resistance to the effects of bad weather. Black-rush most commonly occurs in spells of open weather during the early months of the year, and its first indication is the rather sudden development of diarrhoea which is often dark-coloured and foul smelling. The disease is probably confined to hill breeds, and affected animals rapidly become emaciated, anaemic and weak and are observed to ingest soil and dirt. They are also thirsty and drink continually from muddy water holes. When diarrhoea sets in the disease runs a rapid course and death generally occurs in from one to four days. The evidence collected indicates that black-rush is caused by parasitic infestation of a particular type, and in addition the disease is probably also associated with faulty nutrition.

CASE HISTORIES—FARM 1.—Sixty Blackfaced tup hoggs were moved from a hill farm to lowland grazings in October, 1940, the change being dictated by an abnormally high death-rate among the hoggs on this hill farm the previous year. The tup hoggs began to lose condition in November, and despite generous supplementary feeding they became progressively weaker. The faeces were extremely fluid and dark-green or black in colour. The entire band became emaciated and many died and by the end of January only 23 out of the original 60 hoggs remained alive. Examination of an affected sheep in January revealed:—

Haematocrite (per cent. vol. red cells) 22·0. Eggs per gramme (liquid) faeces 7,000.

Post-mortem examination of a typical case revealed:—

Worm Counts

Abomasum: 30,000 *Trichostrongylus axei*, 13,000 *Ostertagia circumcincta*. Total 43,000.

Small intestine: 30,000 *T. vitrinus*, 15,000 *T. colubriformis*, 5,000 *Nematodirus* spp., 300 *Bunostomum trigonocephalum*. Total 50,300.

Large intestine: 140 *Trichuris ovis*, 88 *Chabertia ovina*, 87 *Oesophagostomum venulosum*. Total 315.

No larval forms were detected. The small intestine showed little or no inflammation, but inflamed points in the large intestine indicated the site of attachment of *O. venulosum*. The disease was therefore diagnosed as parasitic gastro-enteritis, trichostrongyles being the predominant parasites. Fifteen grammes of phenothiazine were administered in mid-January to 35 hoggs. Twelve of the weaker animals died despite treatment, but the others slowly improved in condition and subsequently recovered. It is important to note that from October the Blackfaced hoggs were pastured along with a number of lowland home-bred hoggs. Since these latter hoggs remained healthy it is clear that the Blackfaced hoggs must have been infested with worms when moved in October, having doubtless acquired the infestation the previous summer and autumn while on their home pastures. This conclusion is supported by the absence of larval forms in the gut contents and by the farm history which dictated the necessity for the change in October, 1940.

FARM 2.—Here severe losses had occurred for a number of years among Blackfaced hoggs during winter and early spring. In autumn, 1940, the hoggs were brought in from the hill grazing and put to winter on enclosed pastures. During winter many hoggs developed diarrhoea and weakness and many deaths occurred. Before death diarrhoea became more marked, the faeces being liquid, dark in colour and foul smelling. A few badly affected animals recovered spontaneously. Only half the original flock survived the spring and these were weak and anaemic. Examination of an affected sheep in March revealed:—

Haematocrite 21·5 (some as low as 14·0). Eggs per gramme faeces 6,600.

Post-mortem examination of a typical case revealed:—

Worm Counts

Abomasum: 8,000 *T. axei*, 2,500 *O. circumcincta*. Total 10,500.

Small intestine: 24,000 *T. vitrinus*, 7,500 *T. colubriformis*, 1,000 *Cooperia* spp. Total 32,500.

Large intestine: 65 *C. ovina*, 164 *O. venulosum*, 180 *T. ovis*. Total 239.

No larval forms detected.

Treatment commenced in March and consisted of 15 grammes phenothiazine. A steady improvement was noted after the first fortnight during which time a number of severely affected animals died.

FARM 3.—The disease was prevalent on this farm for many years and losses during the past two years have been very heavy. Early in 1942 the Cheviot ewe lambs were fed a supplement of new land hay, but the hoggs nevertheless steadily lost condition and diarrhoea developed in February. After a day or two of scouring blood was noticed in the faeces and death usually occurred thereafter within 24 hours. At this time therefore the outbreak had the appearance of an acute disease. Examination of an affected hogg revealed:—

Haematocrite 19·0. Eggs per gramme faeces 8,200.

Post-mortem examination revealed:—

Worm Counts

Abomasum: 4,700 *T. axei*, 2,500 *O. circumcincta*. Total 7,200.

Small intestine: 8,000 *T. vitrinus*, 3,000 *T. colubriformis*, 500 *Cooperia* spp., 30 *B. trigonocephalum*, 1 *M. expansa*. Total 11,530.

Large intestine: 299 *O. columbianum*, 188 *T. ovis*, 44 *C. ovina*. Total 531.

Treatment with 15 grammes of phenothiazine was effective and brought about a rapid improvement in all save a few very weak hoggs.

FARM 4.—The sheep on this farm were of the rough Blackfaced breed. The hoggs are generally wintered from home, but last winter owing to transport difficulties they remained on the farm. All the hoggs had been dosed the previous summer with a proprietary brand of anthelmintic. Early in the new year the hoggs began to lose condition and many developed diarrhoea of a black tarry nature, due possibly to admixture with blood. From this time the course of the disease was rapid, ending in death after one to three days. Recoveries were rare. Seventy hoggs died from a flock of 150.

Post-mortem examination of an affected hogg revealed:—

Worm Counts

Abomasum: 11,400 *T. axei*, 2,500 *O. circumcincta*, 450 *O. trifurcata*, 250 *O. ostertagi*. Total 14,600.

Small intestine: 8,000 *T. vitrinus*, 3,000 *T. axei*, 1,200 *T. colubriformis*, 500 *Cooperia* spp., 1,200 *N. fillicollis*. Total 13,900.

Large intestine: 95 *T. ovis*, 70 *O. venulosum*. Total 165.

No larval forms detected.

Treatment consisted of an initial dose of 20 grammes of phenothiazine, followed in two weeks by a second dose of 5 grammes. Most of the treated hoggs improved in condition and eventually recovered.

DISCUSSION

Black-rush is a parasitic disease, principally, if not entirely, affecting hill hoggs. It is seasonal in incidence, most outbreaks occurring during the early months of the year, that is, at the time of maximum nutritional and climatic stress.

The disease is of common and widespread occurrence, and reports indicate that it probably causes much wastage in valuable breeding stocks of sheep. Black-rush appears to be a form of winter trichostrongylosis probably identical with the disease known as "black scours" in Australia, which is caused by heavy infestations of trichostrongylus species (Clunies Ross and Gordon, 1936)[1].

The presence of high worm burdens in affected sheep and the diagnosis of parasitic disease does not preclude the operation of faulty nutrition. On the contrary, under- or mal-nutrition is almost certainly a contributory factor, the parasites administering the *coup de grâce* to sheep already weak and anaemic from nutritional and climatic hardships. This association of adverse conditions of nutrition, etc., with parasitic disease has already been observed by Clunies Ross and Gordon, Taylor (1934)[2], by Morgan and Oldham (1934)[3]

and by Stewart and Ponsford (1936)[4]. Hoggs of hill breeds winter best in the lowlands but there is often difficulty in obtaining adequate pasturage; there should, however, be no difficulty in carrying out a concentrated attack on stomach and intestinal parasites. Some evidence has been obtained showing that hoggs frequently acquire a large worm burden during summer and autumn, and anthelmintic treatment would obviously benefit these hoggs, which would otherwise carry their worms throughout the winter. It is therefore recommended that all ewe and tup hoggs, whether they have received worm treatment in summer or not, should receive at least one full dose of anthelmintic treatment in the autumn. Early in December would probably be a suitable time for treatment and phenothiazine is the anthelmintic of choice. More will be said about nutritional adjustments in a further paper.

Conclusion

For preventing losses in young hill sheep from parasitic disease during winter and spring (black-rush), it is recommended that all hill hoggs should be dosed with phenothiazine in December.

References

[1]Clunies Ross and Gordon. (1936.) Angus Robertson, Sydney.
[2]Taylor, E. L. (1934.) *J. comp. Path.* **47.** 235–254.
[3]Morgan and Oldham. (1934.) *J. Helminth.* **12.** 177–182.
[4]Stewart and Ponsford. (1936.) *J. comp. Path.*

Sulphamethazine and Sulphadiazine Treatment in Caecal Coccidiosis of Chickens

A Preliminary Note

by

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Results of preliminary experiments, described below, in which two closely related sulphonamides, sulphamethazine* and sulphadiazine, were administered as a prophylactic measure, have shown a considerable reduction in mortality in chicks which had received infective doses of *Eimeria tenella* sufficient to cause acute caecal coccidiosis in untreated birds.

Sulphamethazine

The first experiment was carried out with six groups of eight chicks which had received large doses of sporulated oöcysts at varying intervals before treatment began. Results are shown in Table I.

Table I
Showing the effect of the administration of sulphamethazine in capsule form

Number of group. Eight chicks in each group	Daily dose of sulphamethazine (g.)	Interval between infective dose of oöcysts and first dose of sulphamethazine (hours)	Number of chicks dying of caecal coccidiosis
1	0·05	0	0
2	"	24	0
3	"	48	0
4	"	72	0
5	"	96	1†
6	None	—	5

† Although numerous schizonts were found in this bird at *post-mortem* examination, there was no blood in the caeca and the chick is not considered to have died of coccidiosis.

In a second experiment large numbers of oöcysts were administered to twelve chicks. Forty-eight hours later six of these chicks were transferred from the normal ration to a ration containing 2 per cent. by weight of sulphamethazine. The six control chicks all succumbed to acute caecal coccidiosis on the fifth day, but no deaths occurred among the chicks receiving the treated ration.

In a third experiment 24 chicks received massive doses of oöcysts and 66 hours later 12 of these chicks were transferred from the normal to the 2 per cent. sulphamethazine ration. Deaths occurred among the control chicks on the fifth day and nine of the twelve chicks died of acute caecal coccidiosis. The chicks receiving the treated ration remained normal. These results have since been confirmed with other small groups of chicks.

A further experiment was made in which the amount of drug in the ration was reduced to 1 per cent. fed at only one meal each day. Four groups of ten chicks each were treated as shown in Table 2.

Table II
Showing the effect of the administration of sulphamethazine in the ration

Number of group. Ten chicks in each group	Interval between infective dose of oöcysts and first feed of 1 per cent. sulphamethazine ration (hours)	Number of chicks dying of caecal coccidiosis
1	24	0
2	48	0
3	72	1
4	Normal ration	8

* We are indebted to Imperial Chemical (Pharmaceuticals), Ltd., for the supply of sulphamethazine.

Sulphadiazine

The few small-scale experiments so far undertaken with sulphadiazine give promise of equally good results.

In a second experiment four chicks were transferred to a 1 per cent. sulphadiazine ration 24 hours before infection with a massive dose of oöcysts. Four control chicks succumbed to acute caecal coccidiosis on the fifth day, but the four chicks receiving the treated ration survived.

In a second experiment four chicks were transferred to a 1 per cent. sulphadiazine ration 24 hours after infection, four controls being maintained on the normal untreated ration. The control chicks died on the fifth day following infection and *post-mortem* examination revealed acute caecal coccidiosis, but the chicks receiving the treated ration, apart from one which died early in the experiment, survived.

A third experiment comprised 24 chicks which were divided into four groups of six and received the following treatment after administration of oöcysts.

Table III
Showing the effect of the daily administration of sulphadiazine in the ration

Number of group. Six chicks in each group	Interval between infective dose of oöcysts and first feed of 1 per cent. sulphadiazine ration (hours)	Number of chicks dying of caecal coccidiosis
1	24	0
2	48	0
3	72	0
4	Normal ration	6

The results of these experiments, together with those previously reported[1] for sulphaguanidine, afford further evidence of the value of the sulphonamides over other drugs so far examined.

Sulphamethazine and sulphadiazine are the only drugs so far investigated which show beneficial properties when administered after heavy coccidiosis infections and which promise to be of practical value. The effect of solutions of these substances on infected chicks is also being investigated and it is hoped to publish the results in the near future. The toxicity of these substances has not yet been ascertained, nor has the minimum effective dose.

Summary

Small daily doses of sulphamethazine or sulphadiazine administered either separately or in the food gave almost complete protection against the development of coccidiosis in chicks which had received lethal doses of oöcysts up to 72 and 96 hours previously.

Reference

[1] Horton-Smith, C., 1942. Sulphaguanidine in Avian Coccidiosis. *Vet. Rec.* **54.** 259.

Weekly Wisdom

The stupidest people can generally do something, and it is often the very thing of which the cleverest are wholly incapable.—Hazlitt.

* * * * *

The main emphasis now in British agriculture—which in three years has become the most highly mechanised in the world—is on ways and means of increasing the productivity of the soil and dairy herds, and a great educational campaign has been launched which aims at securing a widespread adoption of the methods of the best farmers.—*Mr. Hudson.*

CLINICAL COMMUNICATION

Mustard Gas Burns and Treatment

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It is hoped that the following case of liquid mustard gas burns and their treatment in a Cross-bred Terrier bitch may be of some interest to the profession.

History.—It was during a demonstration of gas bombs on September 5th, 1942, that the accident occurred. It is thought that the crack made by the bursting canister of liquid mustard so frightened the bitch that she bolted for home, running across the main splash, which was about six feet wide, on her way. She was immediately followed by the A.R.P. Officer in Charge and members of the Decontamination Squad who were present with all the equipment necessary to deal with gas casualties. Before the bitch could be caught, it was estimated that eight minutes had elapsed. She was immediately cleansed with warm water, soda and soap, particular attention being paid to the feet. Eight ounces of Anti-Gas Ointment No. 2 were then applied and the bitch left with the owner, who was given strict instructions that the A.R.P. authorities be notified should she not progress satisfactorily.

Examination.—A call was received at the surgery on September 9th from A.R.P. headquarters asking that the bitch be examined. The preliminary examination revealed that the feet had been badly burned and by now had gone septic, and that with running through the liquid some had been splashed up on to the skin of the abdomen, the inside and outside of both thighs, hocks and lips of the vulva. It was decided that the bitch be brought into the kennels for treatment.

On arrival there the parts were well cleansed with warm water and as much hair clipped away as possible. The affected areas were then seen to be covered with small ulcer-like spots, many of which had coalesced to form patches varying in diameter from three inches to half an inch. The feet were just raw flesh with separation of the pads and pus exuding from between all the toes. There were no symptoms that the bitch had inhaled any of the vapour.

Treatment.—The affected parts were dressed with 1-1,000 euflavine solution and a 5 c.c. intramuscular injection of soluseptasine given. This dressing was continued for several days with a daily injection of 2 c.c. soluseptasine.

The sepsis in the feet appeared to have cleared up on September 15th and the injections were discontinued. The ulcerated areas were showing no sign of improvement, and in fact some of the patches were growing larger.

It was now decided to paint the affected parts daily with tar dermament (Parke, Davis & Co.) and within two days improvement was noticed. This treatment was continued for a further twelve days, at the end of which period there was only one small area—about a quarter of an inch in diameter—left unhealed. No more dressings were applied after September 30th and the bitch was discharged as cured on October 5th.

NEW MINISTRY OF PLANNING

In the House of Commons on Tuesday of last week, Sir William Jowitt, the Minister responsible for co-ordinating post-war plans, announced the Government's decision to constitute a separate Ministry, with a separate Minister, of Town and Country Planning for England and Wales, and a Commission to assist the Minister. In Scotland, the executive responsibility for town and country planning and for control of the use of the land will be entrusted to the Secretary of State. This decision deviates from the recommendation of the Scott and Uthwatt Committees that the central control should be exercised by a standing committee of the Ministers concerned with the different phases of planning under the chairmanship of a non-departmental Minister.

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PASTEURISED MILK: M.P.s' MOTION OF DISAPPROVAL

Sir Percy Hurd, Sir Henry Morris-Jones, Lady Davidson, Sir Stanley Reed, Dr. Peters, Sir Robert Gower, and many other members of all parties in the House of Commons have tabled the following motion:—

That this House, realising the unique value of fresh milk in the national diet, asks that his Majesty's Government should not, without the fullest inquiry, embark upon a policy involving the consumption of half-boiled milk, frequently known as pasteurised milk, which is still the subject of conflicting expert opinion; and further urges his Majesty's Government to pursue with vigour a policy to eliminate cattle disease, exterminate vermin, improve water supplies, and establish higher standards of cleanliness and hygiene on the farm and in the transport and the handling of milk on its way to the consumer.

ANNOTATION

Cancer in Animals

Cancer of domesticated animals has not been studied so extensively as that of man; a reminder of this is seen in Willis (1934—"The Spread of Tumours in the Human Body"), where in the animal section reference is mainly to tumours of laboratory animals. This neglect has been partly due to pressing disease problems of a more economic nature while the claims of bacteriology have been so prominent that veterinary pathology has never been fostered as it might have been. Another reason is that systematic routine autopsies are not done on animals on a large scale and only a small proportion of the animal population comes to autopsy by the veterinary pathologist. Carcase inspection in slaughter-houses is not of much value as most animals killed for food are not of the cancer age. Nevertheless, records of animal cancer abound in veterinary literature although many are of dubious value as the pathological descriptions are often inadequate and unillustrated. Articles on the incidence of cancer cannot escape the criticism that the material has been derived from a highly selected source of animal population; hence the disparity of opinion of the frequency of types of tumours. Many of the older papers give little beyond a subdivision of carcinoma and sarcoma. Unless meticulous autopsies with histological examinations are made on a large series of animals many tumours, especially of the internal organs, may evade recognition or diagnosis may be uncertain. The bulk of animal tumour records appear to concern the skin, eyes, lips, mouth, breast, tongue, tonsils, anus, etc., which only means they are more easily and clinically discernible; more attention has been paid to the dog than any other animal. Gliomata are regarded as rare in domestic animals, but until many thousands of brains have been examined, we really do not know if this is so. The few records have mostly referred simply to a "glioma" or a "gliosarcoma" and it is only recently that modern neurological nomenclature has been used, *e.g.*, Jungherr and Wolf (1939). Hodgkin's disease is referred to in English veterinary text-books as an established entity in dogs but there have been no authenticated cases reported; the disease seems to have been confused with leukaemia. A few of the neoplastic or neoplastic-like diseases which have not been identified clearly in domesticated animals might include meningioma, the gliomas, bronchial carcinoma, the reticulo-endothelioses, the "lipoidoses" (Gaucher's and Niemann-Pick's diseases), Ewings' tumour, chordoma, glomangioma, adrenal neural tumours and most of the sarcomata of bone and bone marrow; other tumours have been recorded with full data very rarely, *e.g.*, gastric and rectal carcinoma. Their reputed non-occurrence may be more apparent than real for many might be found if a more systematic search was made. On the other hand, several tumour peculiarities in animals are probably not well known to the medical oncologist, *e.g.*, the benign and malignant forms of osteogenic breast tumours in dogs, squamous-cell carcinoma of the horse's stomach (said to be associated with *Gastrophilus larvae*), embryonal tumours (Wilm's tumours ?) of pigs' kidneys, etc.

More knowledge is wanted, therefore, of the types, location and genesis of tumours in animals, of the paths of dissemination of malignant tumours and of the survival period of animals after surgical or any other treatment all compared with conditions in man. For example, work on the spread of cancer of the human breast would certainly be amplified if comparative studies were made with dog material and much might have resulted from controlled clinical trials on the treatment of spontaneous tumours of animals by X-rays, irradiation, etc. Oncology would benefit if such a wider view were taken, as many practical and theoretical problems could be better investigated by using both animal and human material than by the latter alone. In a paper by Innes (1942) dealing with testicular tumours in animals a useful lead is given in these directions from the point of view of comparative pathology. This is one study of a group of tumours, which was intended to be the forerunner of several papers covering many aspects of animal cancer. Some of the animal material has already formed a basis for comparative studies in the monograph "Debatable Tumours," etc., by Harvey, Dawson and Innes (1941).

In man testicular tumours appear to be a rare form of cancer—Brines (1930) found records of 700 cases in the literature while Tanner (1922) mentions that only 50 cases were observed in 300,000 admissions at the Mayo clinic and 65 in 110,000 admissions at the London Hospital. There appears to be a far greater frequency of testicular tumours in dogs in which the commonest tumour is the seminoma or embryonal carcinoma; 32 cases (surgical and autopsy) were collected by Innes. The nature of these tumours in both animals and man was dealt with in "Debatable Tumours, etc.", by Harvey *et al.* Although in the past the seminoma was regarded as a round-cell, or alveolar, sarcoma its epithelial nature is no longer disputed. Recent discussions have been mainly concerned in deciding whether the seminoma is a one-sided development of teratoma or a tumour derived from

undifferentiated spermatogenic tissue—views which can be easily reconciled. The seminoma can be regarded as an anaplastic carcinoma arising from the seminiferous tubules in exactly the same way as glandular carcinoma anywhere else in the body. The seminoma in man and animals is at least pathologically identical.

Innes deals at length with the part played by the interstitial-cells of the testis in tumour formation. The idea that tumours in man might arise from these cells is a very old one (Waldeyer, 1872), although the number of true, authenticated cases, is very small (Jemerin, 1937). A number of authors have recorded the presence of "interstitial-cell tumours" in dogs; most of these according to Innes come into the category of a nodular hyperplasia of normal cells comparable to the similar overgrowths frequently seen in the spleen, adrenal, liver, thyroid and pancreas of old dogs, all of which have been called tumours at some time or other. It is suggested that these nodular hyperplasias of interstitial-cells may be due to some hormonal imbalance. A case of a benign interstitial-cell tumour in a calf and two established malignant growths in dogs are also described and it is considered that the concept of this type of tumour being "hypernephromatoid" in nature is no longer necessary.

Fifteen testicular tumours in Innes' series were identified as Sertoli-cell tumours or tubular adenoma—a very rare type of tumour in man which has only been recently clearly established and one not previously described in animals. These tumours in man are associated with a disturbance in the libido; some of the dog cases apparently also showed sexual disturbances and in other cases a peculiar alopecia which was cured after the testicular tumour was extirpated.

Three cases of reputed teratoid tumours from cryptorchid horses were examined and only one of these was regarded as a true teratoma; Innes raises the question as to whether many of these so-called "teratoma"of cryptorchid equine organs are true teratoma. The nature and genesis of teratoma has been fully discussed by Willis (1935, 37 and 39) and by Nicholson (1929). As Willis says, the diversity of the hypotheses as to their origin indicates our real ignorance. At one time or another they have been attributed to internal twinning, proliferation of dislocated blastomeres, growth of fertilised bodies, parthenogenesis and developmental errors of the primitive streak and axial structure of the embryo. While none of these older hypotheses can be accepted it is premature to make a new one. Willis considers that attempts to divide them into embryonal and adult, bidermal and tridermal, cystic and solid is purely artificial; the term dermoid cyst is inadequate and unnecessary as it gives an erroneous idea of structure. Complex structures such as intestinal cavities and tooth sockets may develop but this may be an expression of local, mutual influences of several tissues upon one another. Nicholson vigorously attacks the idea that the teratoma are attempts to form an embryo or organoid structures.

Probably the most important observations by Innes concern the consideration of malignancy. It is often taken for granted that tumours of animals of the same pathological type as those in man behave in the same benign or malignant way. This is by no means certain. There have been no such systematic "follow-ups" of animal cancer cases as operate in cancer centres of large hospitals. In man the spread of testicular tumours is first of all along the lymph paths which find first a focus in the para-iliac and para-aortal nodes. The inguinal nodes, which do not drain the testis, are not involved until the tumour spreads by contiguity to the scrotum. There has been considerable difference of opinion regarding malignancy, prognosis, and post-operative survival of testicular tumour cases in man. On the one hand it has been considered that few cases of malignant disease have a worse prognosis than tumours of the testes and that orchidectomy is useless, while other medical authorities have disapproved of the hopeless outlook which has been gradually adopted and state that the seminoma is not so malignant as generally believed. Twenty of the canine cases of Innes treated by castration were followed up—some for many years. In the case of the seminoma orchidectomy produced a high rate of cure; most dogs survived for at least two years, a number for much longer and one for seven years; autopsies of cases showed that metastasis did not occur even where the primary growth was rapid nor was spread noticed in cases operated on a long time previously. It was concluded that the results might be taken to support the views of those who believe that the human seminoma is less malignant than has hitherto been believed.

References

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———. (1939.) *Ibid.* **46.** 198.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Dec. 16th.—Meeting of the Section of Comparative Medicine of the Royal Society of Medicine, 1, Wimpole Street, W.1, 2 p.m. for 2.15 p.m.

Jan. 5th and 6th, 1943.—First Annual Conference of the Veterinary Students' Association of Great Britain and Eire, at the Royal Veterinary College, Streatley, nr. Reading.

Jan. 16th, 1943.—Meeting of the Society of Women Veterinary Surgeons at Birmingham.

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Stilboestrol Dipropionate in the Treatment of Anoestrus

Members may recall that in our issue of March 7th, 1942, under the heading of "The Uses of Stilboestrol Dipropionate in Cattle Practice," a summarised report was given of the meeting held at the N.V.M.A. offices on December 11th last. In the course of this report it was emphasised that care should be exercised in the use of stilboestrol dipropionate, particularly in the treatment of anoestrus in the cow and heifer. The Survey Committee considers it appropriate to repeat this warning at the present time—at the beginning of the "anoestrus season."

From experience gained since the above meeting it is evident that the value of stilboestrol in inducing oestrus *with ovulation* is relatively low. The level of success in cows is moderate, but lower during the winter months. In anoestrus heifers stilboestrol can only be recommended during the natural breeding season; heifers injected at other periods usually show visible oestrus, but it is rare for ovulation to occur.

When oestrogen therapy is used with a view to obtaining a fertile mating in the cow or heifer, it is essential to take certain precautions. In addition to an examination of the ovaries prior to injection, evidence of ovulation should be confirmed by manual examination of the ovaries some ten to fifteen days after the injection to establish the presence of a corpus luteum; alternatively service should be postponed until oestrus occurs naturally.

It may now be regarded as bad practice to induce oestrus with stilboestrol dipropionate and, after service, to accept the animal as pregnant because oestrus does not recur at the normal period thereafter.

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PERSONAL

Benevolent Society Presentation to Mr. R. C. Locke.—At a meeting of the Council of the Veterinary Benevolent and Mutual Defence Society a pleasant interlude took place, Mr. R. C. Locke, the late Secretary for a number of years, being the recipient of a silver salver suitably inscribed, together with a cheque, the balance of subscriptions collected, as a mark of appreciation for his services rendered. The total amount subscribed was £49 15s. 6d.

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Marriage.—Fuller—West.—At the Parish Church, Frampton, Dorset, on November 28th, 1942, Lawrence W. Fuller, M.R.C.V.S., to Rosa V. West.

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Forthcoming Marriage.—The engagement is announced between Richard Douglas Franklin, only son of Mr. H. R. Franklin, of Bacons End Farm, Coleshill, Birmingham, and Margaret R. Bryce, M.R.C.V.S., only daughter of Dr. and Mrs. W. A. Bryce, of Lozells, Birmingham.

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R.C.V.S. OBITUARY

Graham, James, Hollands, Caerlaverock, Dumfries. Graduated Edinburgh, July 20th, 1933. Died November 10th, 1942; aged 32 years.

Hughes, Hugh Tudor, B.Sc. (Lond.), F.R.C.V.S., Capt. late R.A.V.C., 26, Willow Street, Oswestry, Salop. Graduated London, July 19th, 1907; Fellowship December 6th, 1913. Died December 3rd, 1942; aged 57 years.

Mr. H. Tudor Hughes, B.Sc., F.R.C.V.S.

The death of Hugh Tudor Hughes will be a source of sorrow to the profession, who were anxiously awaiting news of the possibility of his restoration to health following the operation in

Brompton Hospital referred to in our issue of November 28th. We will take early occasion to pay fuller tribute to one who was held in affectionate regard in his profession and by the community which both he and his father before him served so faithfully at Oswestry. Mr. Hughes was for many years an Examiner in materia medica to the Royal College of Veterinary Surgeons. His widow, Mrs. Mabel Hughes, with whom the deepest sympathy is felt, is a native of Llandaff. The N.V.M.A. and the Midland Counties Division, who delegated Mr. Hughes for a long period to the Council of the parent body, were represented at the funeral at Oswestry on Monday, the former by Capt. J. R. Barker, of Hereford, and the latter by Mr. T. Thomson, of Market Drayton.

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JOINT COUNCIL OF SCIENTISTS

Mainly through the instrumentality of the Institute of Chemistry and the Institute of Physics a Joint Council of Professional Scientists has been set up with the following objects: To voice the collective opinions of qualified scientists on matters of public interest, to provide a liaison between professional organisations of scientists for co-ordinated action in matters of common interest, and in particular to concern itself with:—

(i) The utilisation of scientists to the best advantage in the service of the community;

(ii) The education, training, supply and employment of scientists;

(iii) The better understanding of the place of scientists in the community;

(iv) The maintenance of adequate qualifications and ethical standards among professional scientists;

(v) The supply of information and advice to public and other bodies on matters affecting scientists.

Sir Robert Pickard has been appointed Chairman and Dr. H. R. Lang Honorary Secretary of the Joint Council.

Among the matters receiving the Council's attention are the proposed Central Scientific and Technical Board, the Ministry of Labour's announcement regarding the minimum number of hours per week to be worked, and the continuance of the Central Register in some form after the war. The Joint Council has been established for the period of national emergency, but the promoters believe it may form the nucleus of some more permanent organisation to facilitate the close collaboration between professional men and women practising in all branches of science.

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FOOT-AND-MOUTH DISEASE POLICY

Addressing a Ministry of Agriculture conference in London recently, Mr. D. A. E. Cabot, chief veterinary officer, made an effective defence of the official slaughter policy in controlling foot-and-mouth disease.

Intensive search has been made for immunising agents. The serum used in parts of the Continent confers immunity against the virus causing the disease for only 12 or 14 days. Vaccines, when successful, give an immunity of no more than three or four months. But the problem is enormously complicated by the fact that three distinct forms of the disease occur in Britain and sometimes simultaneously. If an animal can be immunised against one form it remains susceptible to the others. One form alone that spread over Europe in 1938 infected 660,000 farms and cost German agriculture £80,000,000, although Germany tested on the widest possible scale a vaccine discovered in Denmark. Denmark maintained the slaughter policy, and Sweden even undertook to contribute towards her neighbour's expense on this account, because of the consistent tendency of infection to spread from West to East in Scandinavia.

This year between 600 and 700 outbreaks have occurred in Britain, and many of the epidemics have started among pigs, in which symptoms are not so easily recognised by farmers as among cattle. Of 32 initial outbreaks during the past summer 18 were caused by infected swill. Sterilisation of all food waste used to feed farm animals is compulsory, but even on farms where swill had been boiled scraps of meat and bone had retained the living virus, which unfortunately also survives cold storage. No outbreak, however, has been traced to waste passed through a concentrator plant such as is used by many townships and is being provided at barracks and camps. No disease, said Mr. Cabot, spreads with the rapidity of foot-and-mouth. Within two or three days of infection cattle, sheep and pigs become highly dangerous to others.

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Since our last reference to outbreaks, the existence of foot-and-mouth disease has been confirmed among cattle in the Chard district of Somerset and at Biddestone, near Chippenham, Wilts.

NUTRITION SOCIETY

Trace Elements in Relation to Health

The eighth scientific meeting of the Nutrition Society was held on Saturday, October 17th, at the London School of Hygiene and Tropical Medicine, and took the form of a whole-day conference on "Trace Elements in Relation to Health." A considerable percentage of the large number of people present was composed of veterinarians or of workers in the veterinary field, and the proceedings were of such direct importance to the profession and its work as to merit a fairly comprehensive account.

At the morning session the chair was taken by Dr. J. Russell Grieg, M.R.C.V.S. (Animal Diseases Research Association, Moredun), who described the history of "pining" in Scotland from its first description by James Hogg, the Ettrick shepherd, in 1831. The subsequent papers are summarised below:

(1) Significance of Trace Elements in relation to Diseases of Plants and Animals. (Dr. H. H. Green, Veterinary Laboratory, Weybridge.)

Dr. Green described his paper as a "bird's-eye view" of the significance of trace elements in relation to animal and plant nutrition, and as an introduction to the more specialised communications of later speakers. His more important points may be summarised as follows:—

In biological usage the term "trace elements" refers to any element which commonly occurs in minute amounts in living tissues, whether it is known to exercise any useful function or not. This definition was discussed by several of the later speakers. The plant, in absorbing essential major mineral nutrients from the soil, incidentally takes up traces of numerous other elements merely because they are brought into solution by the action of its roots. Some of these elements are inert (*e.g.* nickel), others are beneficial in small traces but harmful if present in larger amounts (*e.g.* copper), while others again (*e.g.* zinc), while perhaps inessential in the strictest sense of the term, appear to stimulate crop production and to increase resistance against disease. The physiological function of some elements may be quite different in plant and animal economy, *e.g.* the requirements for iron and copper of the plant are below those of the animal in the sense that a pasture may be growing luxuriantly and yet induce anaemia in the grazing animal. On the other hand *boron* is a limiting factor in plant health, but, if essential for animal health at all, the smallest quantities ever found in plants appear to be sufficient in the sense that no "boron deficiency disease" has ever been recorded in animals.

Copper (Cu).—The occurrence of this element in plant and animal tissues has been recognised for over a century, but its real importance has been realised only within the past decade. Deficiency in plants and grazing animals may co-exist (*e.g.*, in Schleswig-Holstein, "Urbarmachungs Krankheit" occurs in plants and "Lecksucht" in cattle), and fertilising with copper sulphate abolishes both diseases. Copper deficiency is encountered along the whole Southern coast of Australia and in cattle a condition termed "falling disease" results. This is characterised by cachexia, anaemia, suppression of oestrus in cows, and stunted abnormal growth in calves. Sheep also are affected and in both species a low milk Cu is found. "Enzootic ataxia" of lambs, which occurs in these areas, is a demyelinating disease which appears to be analogous with "swayback" and which is preventable by supplying small amounts of copper (as copper sulphate) during pregnancy. There appears to be no condition parallel with "falling disease" in Great Britain, but in the U.S.A. a form of ataxia which occurs in foals bred on limestone soils has, rightly or wrongly, been compared with "swayback." "Piglet anaemia" is possibly associated with Cu as well as with Fe deficiency. The phenomenal growth rate of the selectively-bred modern domestic pig seems to have outrun the capacity of the udder to supply trace elements. The gap between the nutritional requirement for copper and that which will produce toxic effects is a wide one: in sheep, *e.g.* 5 mg. per day in the form of a soluble salt prevents disease, but 100 mg. daily can be given for an indefinite period with impunity.

Cobalt (Co).—This is dealt with in a later paper. No definite correlation between plant growth and the presence of Co has yet been established. Co is highly essential for ruminants and "Coast disease" of sheep (S. Australia), "enzoötic marasmus" of cattle and sheep (W. Australia), "bush sickness" and Morton Mains "sheep ailment" (New Zealand), "Grand Traverse" disease or "lake shore disease" (Michigan) are all attributed to Co deficiency. "Neck-ail" (Massachusetts), "salt sick" (Florida), "Nakuruitis" (Kenya), and "vinquish" (Scotland) were formerly attributed to iron deficiency, but are now being reconsidered in terms of trace elements in the wider sense. Fortunately the remedy for Co defi-

ciency is simple: 0·1 mg. of soluble Co for sheep and 1 mg. for cattle are usually sufficient daily doses.

Manganese (Mn).—This element is essential for plant growth and good health and is recognised as being indispensable for animal life. It appears to be associated with growth rate, skeletal metabolism, ovulation and foetal development. In general, however, there appears to be sufficient Mn present in plant food to prevent deficiency disease in animals. "Slipped tendon" or "perosis" of intensively-reared chicks may be produced experimentally on low-Mn rations, but other factors are probably involved in its aetiology. Certain forms of delayed ovulation in the larger farm animals have, rightly or wrongly, been associated with Mn deficiency occasioned by excessive liming, a procedure which reduces the availability of soil Mn to the plant.

Zinc (Zn).—Traces of Zn have been shown to be essential for normal development of certain moulds and higher plants. Experimental Zn deficiency may be induced in animals by feeding synthetic diets: symptoms include depressed growth, depigmentation of fur and hyperkeratinisation of skin, while purine metabolism is interfered with. No naturally-occurring deficiency disease is, however, to be expected, since an ordinary diet may well supply 0·1 mg. Zn. per kg. body weight.

Boron (Bo).—This element is essential for plant health, but since white rats can complete their life cycle on experimental diets containing only 0·2 p.p.m. of Bo, there seems to be little likelihood of Bo deficiency occurring naturally in animals.

Fluorine (F).—Spontaneous fluorosis in animals is found in many parts of the world, the most notable diseases being "Darmous" of the rock phosphate areas of Algeria and "Gaddur" of the volcanic soils of Iceland.

Selenium (Se).—This inessential element is vastly more toxic for animals than for plants. Selenosis has not been encountered in Great Britain, but in some parts of the world, notably in S. Dakota, west of Missouri River, it has occasioned serious disorders in all stock, including poultry. The so-called "alkali disease" of this area, manifested by depressed growth, loss of hair most conspicuous in the mane and tail of horses, abnormal development and sloughing off of hoofs, is now known to be due to Se poisoning. Amongst poultry a conspicuous feature is inviability or hatching of monsters. A safe limit is about 3 p.p.m. for grain, and the effect of a 10 p.p.m. level in wheat on hatchability of eggs is obvious from the seventh day onwards. "Blind staggers" of range cattle in Wyoming is a more acute form of sclerosis than alkali disease and in it death from liver damage occurs before loss of hair and hoofs has occurred.

Molybdenum (Mo).—In addition to teart disease, discussed in paper (9), Mo poisoning has been incriminated as a factor in livestock poisoning in some areas of Wyoming, while a form of "bovine haematuria" in S. Australia is at present suspected of being caused by long continued ingestion of Mo in quantities much smaller than those encountered in Somerset.

Among other elements, the functions of *iodine* are now widely known; *aluminium*, *nickel*, *lead* and *arsenic* are not absorbed by plant roots in quantities injurious to animals.

(2) Distribution of Trace Elements in Soils and Grasses. (Dr. R. L. Mitchell, Macaulay Institute for Soil Research.)

Dr. Mitchell discussed in general terms the factors which govern the qualitative and quantitative occurrence of trace elements in soils and grasses. He presented some interesting and important data for trace elements in soils and pasture grasses in N.E. Scotland. In comparison with the major constituents of rocks and soils, the trace elements show extremely wide variations in concentration, often as much as a million fold. The quality of any trace element present in a given soil is dependent upon the original geological formation and upon the nature of the soil-forming processes, *e.g.* upon the degree of weathering and leaching to which the soil has been subjected. The amount taken up by the grasses depends not only upon the total amount in the soil, but also upon the species of grasses and the availability of the trace element as determined by various solid conditions, *e.g.* acidity or basicity. The amount of trace element available to the plant may also increase with the weathering and decomposition of the rock particles forming the soil.

(3) Copper, Zinc and other Trace Elements in Relation to Physiological Function and Enzyme Systems. (Prof. D. Keilin, F.R.S., and Dr. T. Mann, Molteno Institute, Cambridge.) Read by Dr. T. Mann.

The authors suggested that the essential elements would prove to be those found in the ash of milk, *viz.*, Mn, Fe, Cu, Zn, Co, B, F, Li, Si, Rb, Sr, Ti and V, in addition to the well-known major constituents.

They pointed out that a knowledge of the physiological function of a trace element is essential to a full understanding of the significance of that element in nutrition. This point was stressed by several later speakers.

In establishing the function of a possibly essential element, the first step is the identification of the compound in which the element occurs in the body. The authors proceeded to describe the compounds in which they had shown copper and zinc to occur in animal tissues. These elements do not occur in detectable amounts in the inorganic or ionic form but are firmly combined with specific proteins. Copper is present as haemocuprein in mammalian erythrocytes, liver and other tissues, but so far no function had been assigned to this copper protein compound. In plants, however, copper protein compounds function as oxidases. Zinc forms part of the important enzyme, carbonic anhydrase, which catalyses the hydration and dehydration of carbon dioxide and thereby plays an important rôle in the acid-base equilibria of the body. Compounds of these and other trace metals with other specific proteins may also occur in animal tissues. The powerful activity of these metallo-protein complexes is to be judged by the fact that 0·1 microgramme (*i.e.* 1×10^{-7} gramme) containing 0·003 microgramme of zinc could be detected biologically, whereas it was quite impossible to detect such a small amount of zinc by chemical or spectrographic methods of analysis.

(4) Enzoötic Ataxia or "Swayback" of Lambs in England in Relation to Copper Feeding of Ewes During Pregnancy.

The film made by Dr. J. R. M. Innes, M.R.C.V.S., while at the Institute of Animal Pathology, Cambridge, was shown. The clinical and pathological features of "swayback" were depicted, the former being "in colour."

(5) Diseases of Stock in Australia Caused by Deficiency of Cobalt and of Both Cobalt and Copper. (Sir Charles Martin, F.R.S.) Read by Miss Harriette Chick, D.Sc. (Lister Institute).

Sir Charles Martin gave an interesting and valuable account of researches carried out simultaneously in Western and Southern Australia, which established the essential nature of cobalt in the nutrition of a ruminant. The primary object of these researches was to determine the cause of two serious wasting diseases which had long been known to affect sheep and, to a less extent, cattle on certain areas of pastureland along the southern coasts of the Western and Southern States of Australia. In Western Australia progressive emaciation anaemia are the characteristic symptoms displayed by affected animals ("enzoötic marasmus"), whereas, in Southern Australia, the particular type of wasting disease ("coast disease") prevalent there presented an additional feature of progressive ataxia leading in many cases to complete inco-ordination of movement of fore and hind quarters. In animals thus affected demyelination of some of the spinal tracts is a characteristic histological feature, and it is now recognised that two pathological processes operate in coast disease.

In both instances the unsound pastures occur on highly calcareous soils derived in S. Australia from wind-blown sand and sea-shell, and in W. Australia from the weathering of old granitic rocks.

Early observation showed that both diseases could be cured and prevented by administration of limonite and iron-rich ore, but the large doses of limonite that were necessary and the erratic results obtained with different types of limonite and medicinal iron preparations strongly suggested that the curative agent was not iron itself but some factor erratically associated with iron. This suggestion was verified by the complete inadequacy of highly purified iron salts and by the effectiveness of iron-free extracts of limonite. In both States, direct feeding experiments with trace elements finally demonstrated that a daily dose of 0·1 mg. of cobalt both cured and prevented wasting and anaemia in sheep. For cattle a daily dose of 0·5 mg. of cobalt was necessary. In S. Australia a superimposed deficiency of copper was found to be responsible for the ataxia, and this condition could be prevented by administration of copper salts along with cobalt. These trace element deficiencies may be corrected also by top-dressing the unsound pastures with no more than a few pounds per acre of cobalt and copper salts.

(6) Sheep "Pining" in Great Britain. (Mr. W. Lyle Stewart, M.R.C.V.S., King's College, Newcastle-on-Tyne.)

The term "pine" or "pining" is probably derived from the Anglo-Saxon "pinian," to torment or waste away under pain. It has been applied to a number of diseases of cattle, sheep and man where wasting is a characteristic feature, but on the uplands bordering England and Scotland it has come to mean a peculiar malady of hill sheep in which anaemia and emaciation are the main features. "Pining" has been combated in the past by moving the flock twice or thrice a year to a poorer but "healthier" pasture, usually a heather moor. The sheep relish the change for four to five days, then tire of it and appear eager to return home. Curiously enough, they look much worse after the change and lose in weight, but the ultimate benefit is substantial. During recent years fundamental studies of the nutritional, parasitological and pathological

features of pining have been made. The pastures on which it occurs are nutritionally poor, being equivalent in feeding value to a fair sample of meadow hay. They are poor in lime and less than average in phosphorus, not deficient in iron, nor markedly so in Cu, and low in Co although not so low as in the Co-deficient areas of New Zealand. The worm burdens of affected sheep are heavy, but helminthiasis, while an important factor, is certainly not the only one. Lambs are much less parasitised than adult ewes, whereas the reverse would be the case if predisposing nutritional factors were not concerned. Field experiments so far have indicated that either a trace element mixture or anthelmintic treatment (with phenothiazine) has proved beneficial, but that the two combined have proved most satisfactory and have increased the live weight gains very considerably as compared with untreated controls.

These studies on "pining" have given an interesting insight into the sheep husbandry of the areas concerned. The dividing line between a sheep said to be healthy and one thought to be pining is remarkably fine. On many hill farms the plane of nutrition is unnecessarily low and production of wool and mutton is correspondingly reduced. Mr. Stewart considers grading up to be not only necessary but also feasible: while he is opposed to the pampering of hill sheep, he believes that nothing but benefit can result from making good the known and perhaps unknown mineral deficiencies, and by controlling the parasitological feature with regular anthelmintic treatment. Free access to a mineral mixture —not a salt lick—is desirable.

During the discussion on the foregoing papers, Dr. E. L. Taylor, M.R.C.V.S., of the Veterinary Laboratory, Weybridge, pointed out that as young animals grow to maturity they normally develop a relatively strong resistance to most species of parasitic worms, a resistance that is sufficient to maintain them in health under all ordinary conditions of grazing, wherein they would be coming into contact with infection. This resistance is only relative, however, and may be broken down under a variety of stresses, one of the most important of which is nutritional insufficiency. This has been shown experimentally with the stomach worm of sheep, *Haemonchus contortus*. Many workers in the relevant field have expressed the opinion that diet cannot play any important practical part in the development of infectious disease and have pointed out that the point at which the host's resistance is lowered by nutritional stress is not arrived at until the nutritional insufficiency has been so great, in itself, as to exert an obvious deleterious effect upon the condition of the animal. Grazing animals are, however, liable to severe deprivation: during the winter months sheep may actually lose up to one quarter of their body weight, while store cattle are sometimes little more than kept alive on poor quality hay and straw. This nutritional stress comes at a time when the young animal ought to be establishing its immunity and throwing off the more or less large numbers of parasites acquired during the summer months. Consequently the parasites remain and if the animals are still grazing even increase in numbers, with resultant loss of weight by the host. Anything which interferes with the establishment of resistance of young grazing animals to parasitic worms present on all ordinary pastures is of great economic importance. It is probable that, in addition to the various manifestations of disease attributable to "deficiency" alone, the loss among grazing animals deprived of trace elements may be increased owing to the continued parasitic infestation which accompanies such deficiency.

Dr. H. H. Green quoted work in N. Wales from which it appeared that three types of "pine" could occur in sheep. One type responded only to anthelmintic treatment, the second type to administration of cobalt only and the third to administration of both trace element (cobalt) and anthelmintic (phenothiazine).

At the afternoon session, Professor C. R. Harington, F.R.S., took the chair. Section (7) comprised three interesting papers on the role of fluorine in human nutrition, by Dr. M. M. Murray, Dr. D. C. Wilson and Mr. F. H. Kemp. Lack of space does not permit of an account of them, but interested readers will find an account in the proceedings which will be published at some future date.

(8) Industrial Fluorosis of Animals in England. (Mr. F. Blakemore, M.R.C.V.S., Institute of Animal Pathology, Cambridge.)

Industrial fluorosis of animals has been reported in many parts of the world, the industries concerned being those producing superphosphate, hydrochloric acid, glass, enamel and aluminium. Flue gases from these industrial plants have contained appreciable quantities of fluorine which has been deposited on the soil and herbage of neighbouring pastures, the contamination naturally being most serious in the direction of the prevailing wind. Affected animals show lameness, enlargement of the bones and cachexia. Great differences in species susceptibility have been noted, cattle being most prone to fluorosis.

Mr. Blakemore described observations made by himself and his colleagues on an outbreak of fluorosis in cattle grazing in the vicinity of a brickworks which happened to be working on clay containing significant amounts of fluorine. Mottling of the permanent incisors was a constant feature in all cattle reared in the district. Severely affected cattle were lame and suffered considerable pain on palpation of the bones. Abnormally large diameters were recorded for the metacarpals, metatarsals and phalanges. *Post-mortem* examination showed that pathological changes were confined to the skeleton. The bones were enlarged, their specific gravity was reduced and their fragility increased. The main histological features comprised extensive atrophy of the bony structures and the presence of excessive amounts of osteoid tissue.

(9) "Teart" of Somerset: a Molybdenosis of Farm Animals. (Dr. W. S. Ferguson, Jealott's Hill Research Station, I.C.I.)

In central Somerset, an area of about 20,000 acres of pasture—known locally as "teart"—gives rise to scouring in grazing cattle. Smaller areas are found in North Somerset, Gloucester and Warwick. The affected pastures occur on the geological formation known as Lower Lias, and recent research has shown that the scouring is due to the high Mo content of the soil and herbage. Grass from non-teart pastures usually contains less than 5 p.p.m. of Mo, whereas that from teart pastures may contain up to 100 p.p.m. on a dry matter basis. The degree of teartness varies from field to field and from district to district, and varies also with the season. These variations in teartness can be correlated with differences in the uptake of molybdenum and more particularly with differences in the content of water-soluble molybdenum in the herbage. The proportion of the total molybdenum which is water-soluble is about 70 to 80 per cent. in young grass, 40 per cent. in hay and 10 per cent. in dead winter herbage. The losses occasioned dairy farmers in the districts concerned are considerable, but it has now been found possible to control the scouring by feeding 2 grammes of copper sulphate daily to each adult animal and 1 gramme per day to young cattle. The administration of copper can be continued for a period of at least 18 weeks with none but beneficial effects.

Ruminants only are susceptible to "teart" and dairy stock are more seriously affected than fattening cattle. The dung becomes extremely loose and watery, yellow-green in colour, bubbly and foul smelling. Red Devons turn a dirty yellow colour and black beasts turn rusty. Permanent injury or death from scouring may result from too lengthy a spell on teart land. Sheep are not so seriously affected, but become loose and carry dirty tails.

Dr. S. J. Watson (Jealott's Hill) said that the administration of copper sulphate had given very satisfactory results in a large scale field trial carried out this year by the Somerset War Agricultural Committee. Farmers in the teart area had been supplied with a special concentrate mixture in which copper sulphate had been carefully incorporated so that each 3 lb. of food contained one daily dose of copper salt.

Dr. Q. H. Lewis (Jealott's Hill) said the teartness of the herbage could be reduced firstly by suppressing clovers and other legumes in the pasture, since these species of herbage plant absorbed molybdenum more strongly than grasses, and secondly, by the application of fertilisers, *e.g.* sulphate of ammonia and other chemicals which rendered the soil more acid and thereby reduced the availability of the soil molybdenum.

(10) The Absorption and Excretion of Trace Elements. (Dr. R. A. McCance and Miss E. M. Widdowson, Dept. of Medicine, University of Cambridge.)

The trace elements appear to behave largely as one would expect from a knowledge of their chemical properties. If the diet contains substances which form insoluble compounds with the elements concerned, less (of these elements) will be absorbed, *e.g.* the absorption of Ca is decreased in the presence of dietary phosphate or phytate. On the other hand, absorption of Ca and of Mg is increased by protein, since these elements form soluble co-ordination compounds with amino-acids, which are the end products of protein digestion. Renal excretion also is dependent upon the solubility of the compounds of the element. In those cases in which the element concerned (*e.g.* Ca) is secreted by the digestive juices, it is difficult to determine the absolute amount of absorption, and only the "net absorption" (*i.e.* amount in food less amount in faeces) can be calculated. Those metals (*e.g.* Ag, monovalent Hg) which form insoluble chlorides are precipitated by the HCl in the stomach and are, therefore, inactive when taken by mouth. (Ag may, however, be absorbed from the mucous membranes of

the nose and mouth and thus give rise to the occasional cases of argyria which are seen after long-continued Ag medication.)

Dr. N. L. Kent maintained that factors other than the ordinary laws of solubility and chemical behaviour must operate in the absorption and excretion of elements. For example, some people excreted manganese by the large intestine and others did not. Dr. Mann said that by the use of radioactive isotopes it had been shown that iron and copper are converted into their organic compounds four to five hours after ingestion. Dr. R. McCance admitted that the use of isotopes may lead to very important discoveries, but urged caution in the interpretation of the results of experiments with isotopes where complete balance data were not recorded for the element under study.

In his summary of the afternoon's proceedings, Professor C. R. Harington said that trace elements could be considered as belonging to two categories, *viz.* (*a*) Those toxic if present in the soil-water in unusually large concentrations, *e.g.* Mo, Se; (*b*) Those which are normal constituents of the body and to which no definite function had been assigned until recently. Copper and zinc fell into this second category.

He reiterated the importance (already stressed by Dr. Mann and others) of identifying the compounds in which the trace elements occurred in the body. It is only when the functions of a trace element have been clearly defined that full conviction follows that the element is essential. He recalled that many years elapsed between the first recognition and the final general acceptance of the association of iodine deficiency with thyroid disease. Evidence now regarded as overwhelming was to hand many years before the isolation of thyroxine and the determination of its constitution and physiological functions which settled beyond all doubt the essential nature of iodine.

Professor Harington concluded by congratulating the Society most heartily on its choice of programme.

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A VETERINARY EDUCATIONAL TRUST*

In his speech at the Mansion House recently, at the luncheon held in the course of the congress of the National Veterinary Medical Association of Great Britain and Ireland, Dr. W. R. Wooldridge, the president, announced the formation of a National Veterinary Educational Trust. This development is one that is likely to have a profound influence upon the value of veterinary services in the future and is a result of the increased awareness, within and without the veterinary profession, of the importance of animal health and of the place it must take in the national economy.

This century has seen revolutionary changes in the approach to the maintenance of animal health. At the close of the nineteenth century the development of the Pasteurian concept paved the way for the eradication of certain of the more serious scourges, and for a time achievement in this sphere was mainly concerned with infective processes. The advances made were immense and a new type of veterinarian came into the field, armed with a microscope and trained in the methods of microbial preventive medicine. His achievements were of a high order. Animal diseases that had impeded progress in many countries were brought under control: glanders in Great Britain, rinderpest in South Africa, Texas fever and others are examples of diseases on which successful work was done.

The discovery of vitamins early in this century has led to the realisation that these dietary constituents are of great importance to domesticated animals, as they are to man. Later, largely as the result of the start given by South African veterinary workers led by Theiler, certain minerals were found to be indispensable to the life of grazing animals on some types of land. Lack of phosphorus compounds in the pastures had thrown much farm land in South Africa out of production because cattle-farming could not be made profitable, and by the addition of phosphates to the food supply of the cattle the economy of these areas was revolutionised. In addition, calcium, cobalt, copper and other minerals are now known to be essential constituents of the diet of animals and in many parts of the world, including Great Britain, pastures have been found to lack these elements. The rectification of mineral nutritional deficiency is an important and complex question.

The ravages of parasitic worms infesting livestock have been serious. The life-cycles of many helminths that have been unravelled in recent years are almost unbelievably complex, even to those who know that of the liver fluke; a large number of species of worms is involved, and an extraordinarily wide variety of changes of environment and host is resorted to by different worms in order to ensure a return to a victim of the original species, so that the continuity of the parasite may be maintained. Surely parasitic helminths are the most spendthrift gamblers in existence. Modern intensive grassland husbandry tends to favour the existence of bowel parasites of grazing animals, but fortunately advances in knowledge of the bionomics of parasitic worms, especially during the last two decades, have provided measures that can be used to circumvent the invaders.

To meet the threat of these chemical and biological hazards to the health of our economic animals, extensive knowledge of all the factors involved is required, and the veterinarian is the key link in the chain necessary for the application of the counter-measures.

Chemotherapy for worm infestation and for diseases caused by Protozoa, and, nowadays, even for the control of certain types of bacterial infection, is used on a tremendous scale on animals. Here again the veterinarian is a key man.

The outlook has changed from consideration of the requisite bottle of medicine for treatment of the individual case after illness has become apparent, to the design of measures for application to the animals as a whole, so that disease may be prevented. The name "veterinary surgeon" almost indicates too accurately the function of the older type of practitioner, compared with that of the modern veterinarian.

Changing agricultural practice has introduced different and new animal disease problems. Foodstuff economies, increased transportation facilities for animal produce and the increased speed of transport between countries have all been contributing factors in these dangers inherent in modern farming. Diseases occur now on farms in Great Britain that were unheard of a generation ago, and not because they were unrecognised previously. Certain metabolic diseases are examples of this trend. The food supply of modern nations demands greater use of high-quality animal products than in the past, and these demands will be intensified in the future. In the absence of adequate supplies of certain of these foodstuffs, human health is menaced, and much active disease in human beings is caused if disease germs are allowed to be present in animal foodstuffs when they reach the consumer. These dangers to human health are, of course, even greater during war-time than in peace. Here again are examples of problems with which the veterinarian must be prepared to deal.

In his presidential address to the National Veterinary Medical Association, Dr. Wooldridge elaborated in some detail his ideas of the manner in which animal disease should be prevented and controlled in the future. He advocated the formation of an Animal Health Corporation, with governors appointed by the State and with powers akin to those of the British Broadcasting Corporation, policy being decided by the Government, but the Corporation having great freedom in the direction of its execution. This Corporation would be responsible for the activities of a complex staff, including specialists in the several branches of the work, practitioners to do the work on the farms, research workers, and a service to ensure that foodstuffs of animal origin are of the necessary quality and free from danger to the human consumer.

Those responsible for policy realise that the future veterinarian must have the best possible mental equipment if he is to play his part. Governments have done much to provide the necessary training, but Great Britain has lagged seriously behind others in this respect, though some improvement has been made during recent years. It is felt that something more is required for higher veterinary education than can be provided from Government sources and, indeed, that public provision additional to Government subsidy is advisable, so that instruction on the widest possible basis free from official control may be available.

The National Veterinary Educational Trust now announced is intended to provide the finances for the extension of the educational organisation. An influential board of directors to manage the Trust has been appointed, and it is estimated that a minimum of £1,000,000 will be required. Government departments support the aims of the Trust, and it is anticipated that the necessary funds will be forthcoming.

The Trust would provide scholarships to enable deserving students to become veterinary surgeons, and fellowships and studentships so that those who have graduated may pursue courses of study, or undertake research at home or abroad. Equally, grants would be made to enable graduates aspiring to become veterinary teachers to undertake the necessary post-graduate research, and to assist veterinary surgeons in general practice to take refresher courses. On the other hand, every effort would be made to improve the standard of teaching at veterinary schools and increase liaison with the universities.

* The report of a recent discussion, by the Nutrition Society, on trace elements precedes this note. At that meetting veterinarians made an important contribution to a debate in which scientists in widely differing fields of work participated. This debate illustrated the point made in this editorial article from *Nature* that the veterinarian is the key man in all problems concerning the health and disease of livestock.

The formation of an Animal Health Organisation, backed by an active and well-financed Veterinary Educational Trust, such as are envisaged in these proposals, would bring together veterinarians and other workers in many fields bordering on their subject and would give a much-needed stimulus to veterinary studies in Great Britain.

* * * * *

THE FUTURE OF MILK PRODUCTION

"It seems to be quite definite that milk production is to be preferred to the growing of arable crops for direct human consumption," states *The Scottish Farmer* in a recent issue, and continues, "This is a decision of far-reaching importance. The national dietary is centrally planned from the Ministry of Food, presumably under the advice of dietetic experts. The privilege consumers, children, expectant mothers and those afflicted with certain illnesses receive as nearly adequate rations as are possible, and the general public get the surplus. For the next few months it is unlikely that any adult will receive more than two pints per week and this ration may be smaller before the winter months are over. There can be few critics of a national policy which ensures the receipt by the young of the perfect food for building up healthy constitutions and it is a hopeful augury for the future of dairy farming.

Substitutes

"There are some producers who are a little alarmed at the appearance of dried milk. The medical profession have not been helpful in the past in milk propaganda. Milk is almost an ideal bacterial medium and the profession, assuredly from the best motives, have been suspicious of milk as a carrier of disease. The wholehearted efforts of the dairy farmer to rid his herd of tuberculosis are manifest in the prevalence of tuberculin-tested cows, and the number of attested cattle. These efforts are praiseworthy and there has been a notable improvement in the quality of milk. In these days of scarcity of labour and pressure of work at harvest and other times it is reported that there are a few cases of dirty samples, but this is a passing phase which can soon be corrected in more spacious days. But many producers feel that the sterile dried milk which is now being distributed will appeal to the medical profession, and if it gets too great a hold will interfere with the sale of the fresh article. The large industrial towns do not get their milk as quickly from the producer as is desirable and many local authorities insist on pasteurisation. It is a short step from pasteurisation to sterilisation and the dried product. Probably also the baking trade prefer the condensed or dried article.

Needless Concern

"It is unlikely that these fears will be confirmed. The milk-drinking habits now being inculcated into the young will tend towards a natural liking for the fresh article and instead of being the lowest milk-drinking people in Europe, the inhabitants of these islands will steadily progress towards a higher consumption. These islands are ideal for the production of milk and post-war policy cannot ignore the latent possibilities of expansion in production. Whatever may happen to arable cultivation the dairy farmer is assured of a reasonable future.

Labour

"The dairy farmer is far more concerned about the future of labour. There are few recruits to the industry and it is a pressing problem which hardly permits of solution in war years. There are two schools of thought, the one which visualises the splitting up of large units into smaller family concerns, and the other which links of factory production with shifts. Time alone can say which will prove right, but it is certain that there is a definite trend of labour from the industry, and increased wages would hardly check the movement. The main trouble is the long hours and the continuous duty. Private profit, either to the farmer or to the dairyman may, if it is sufficiently large, prevent any large movement for a time, but the movement is there and a solution is not easy to find. Meantime the public are demanding more and more milk."

* * * * *

Sir John Russell will retire on September 30th, 1943, under the age limit, from the Directorship of the Rothamsted Experimental Station. Sir John Russell succeeded Sir Daniel Hall in 1912, and during his 31 years as director the station, the oldest agricultural institute in the world, has shown a remarkable expansion of its research activities and of its authority in agriculture. The station reaches its hundredth year in 1943, and but for the war the centenary would have been the occasion of an international celebration.

SCHEME FOR THE CONTROL OF DISEASES OF DAIRY CATTLE

Statement showing the number of Undertakings notified to the Ministry of Agriculture during the month of November, 1942

County	Undertakings Notified		Total Undertakings		
	During Month	Previously	Number	Number of Cattle	
				Cows	Heifers
ENGLAND					
Bedford	1	25	26	649	430
Berks	6	50	56	2,128	1,536
Bucks	4	39	43	1,086	808
Cambridge	3	10	13	242	118
Chester	31	261	292	9,868	3,271
Cornwall	—	3	3	44	57
Cumberland	3	25	28	746	648
Derby	32	137	169	5,189	2,881
Devon	4	90	94	1,609	977
Dorset	3	31	34	1,122	690
Durham	24	154	178	4,271	1,357
Essex	11	132	143	5,795	3,349
Gloucester	8	55	63	2,030	1,121
Hampshire	32	195	227	7,012	4,343
Hereford	1	16	17	274	168
Hertford	4	44	48	1,479	949
Hunts	—	6	6	177	122
Isle of Ely	—	1	1	1	8
Isle of Wight	2	4	6	105	49
Kent	13	71	84	1,774	1,006
Lancs	11	124	135	4,033	954
Leics	6	45	51	1,323	905
Lincs (Holland)	—	4	4	45	11
Lincs (Kesteven)	1	12	13	144	86
Lincs (Lindsay)	3	46	49	910	400
Middlesex	2	6	8	335	151
Norfolk	4	129	133	3,967	2,596
Northants	3	46	49	1,330	1,033
Northumberland	2	40	42	1,427	729
Notts	17	57	74	1,835	1,030
Oxford	1	20	21	596	650
Rutland	—	8	8	145	102
Salop	21	165	186	6,080	2,775
Soke of Peterborough	—	1	1	37	31
Somerset	7	85	92	2,490	970
Staffs	8	117	125	3,730	1,864
Suffolk, E.	7	57	64	1,681	1,215
Suffolk, W.	2	31	33	674	458
Surrey	6	76	82	2,287	1,089
Sussex, East	22	101	123	3,468	1,909
Sussex, W.	8	68	76	2,115	1,290
Warwick	3	78	81	2,163	1,392
Westmorland	—	17	17	467	537
Wilts	7	42	49	2,161	1,066
Worcester	5	110	115	2,570	1,239
Yorks, E.R.	5	44	49	872	434
Yorks, N.R.	4	68	72	1,465	819
Yorks, W.R.	11	162	173	4,480	1,581
WALES					
Anglesey	9	13	22	444	308
Brecon	—	3	3	50	22
Caernarvon	2	87	89	1,483	771
Cardigan	1	12	13	179	124
Carmarthen	6	148	154	2,860	1,458
Denbigh	1	40	41	841	423
Flint	8	75	83	1,781	851
Glamorgan	8	56	64	1,049	381
Merioneth	—	8	8	100	72
Monmouth	—	21	21	535	302
Montgomery	2	8	10	210	147
Pembroke	5	65	70	1,383	874
Radnor	—	—	—	—	—
TOTALS	390	3,644	4,034	109,346	56,937

Note.—Of the total 4,034 undertakings notified to date, 1,060 are for 1 year, 238 are for 2 years, and 2,736 are for 3 years.

SCOTLAND					
Aberdeen	8	7	15	799	274
Angus	5	6	11	524	166
Argyll	—	2	2	22	46
Ayr	10	3	13	469	412
Banff	—	1	1	75	30
Clackmannan	2	—	2	83	21
Dumfries	3	3	6	362	313
Dumbarton	1	—	1	30	30
East Lothian	1	3	4	94	46
Fife	4	2	6	209	136
Inverness	3	1	4	108	75
Kinross	2	—	2	48	24
Kirkcudbright	5	2	7	525	418
Lanark	3	1	4	135	133
Midlothian	—	1	1	44	69
Nairn	—	1	1	14	—
Peebles	1	—	1	7	—
*Perth	6	4	10	311	182
Renfrew	3	—	3	110	84
*Stirling	4	7	11	351	262
Sutherland	1	1	2	74	60
Wigtown	15	4	19	1,472	811
TOTALS	77	49	126	5,857	3,582

Duration of Undertakings: 1 year, 42; 2 years, 13; 3 years, 71.

* *Note.*—Previous month's figures have included a Perth herd with the total herds in Stirling. This has now been amended.

YOUNG FARMERS' CLUBS

The Minister of Agriculture and Fisheries in consultation with the President of the Board of Education has set up the following Committee to act in an advisory capacity to the National Federation of Young Farmers' Clubs to assist in the development of their activities generally and to take advantage of the opportunities afforded by the Service of Youth:—

The Rt. Hon. Tom Williams, M.P.: Joint Parliamentary Secretary to the Ministry of Agriculture and Fisheries (Chairman).
Mr. V. E. Wilkins, O.B.E.: Ministry of Agriculture and Fisheries (Vice-Chairman).
Mr. B. L. Pearson, D.S.O., M.C.: Board of Education.
Lt.-Col. Sir Merrik Burrell, BT., Mr. E. Salter Davies, C.B.E., and Mr. E. L. Pledger: National Federation of Young Farmers' Clubs.
Mr. W. T. Price, M.C.: Agricultural Organiser and Executive Officer for Wiltshire.
Major Hiles, Secretary of the National Federation, will attend meetings, and Mr. A. R. Whyte, Ministry of Agriculture and Fisheries, will be the Secretary to the Committee.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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TESTICULAR CANCER IN ANIMALS

Sir,—In another column of the *Record* there is an annotation dealing with testicular tumours in animals. Most of the cases mentioned in the annotation were obtained through the help and willing co-operation of a number of veterinary practitioners. I am extremely anxious to obtain more material, in particular to obtain information on the clinical aspect and a suggested line of treatment. I should be glad, therefore, if any practitioners who should happen to read this request and are interested would get in touch with me so that I could give them particulars regarding the information I desire.

Yours faithfully,
J. R. M. Innes.

Biological Department,
Imperial Chemical (Pharmaceuticals), Ltd.,
Hexagon House,
Blackley, Manchester.

* * * * *

DANGER OF RE-INTRODUCTION OF RABIES FROM ABROAD

Sir,—Veterinary surgeons will, I hope, support the action of the National Canine Defence League in asking the Ministry of Agriculture if they will take steps to enlighten the public mind in regard to the danger that rabies may be introduced into this country by soldiers returning from abroad or civilians engaged in the transport services.

We make an appeal to the profession to use its powerful influence to create a conviction that our quarantine laws in regard to dogs and cats must be respected. There is hardly need to remind anyone who is fond of animals what happened after the last war, when scores of thousands of dogs were destroyed owing to the fear of rabies, and hundreds of thousands suffered unhappiness through the infliction of the very necessary muzzling orders.

It is certain that many dogs, and probably cats, will be adopted by the Forces and civilians now landed in North Africa, and there seems a risk that dogs or cats could be smuggled into this country by transport planes, operational aircraft or by ship. As the foreign territories used by this country increase, the danger will grow to larger proportions.

Our League has observed with apprehension the loose thinking in regard to smuggling—the ignorance which prevails about the value of quarantine—and has noted with regret a general attitude to condone and even praise the evasion of the laws which have protected us from the ravages of this painful infection. All these tendencies make it clear that, unless some special effort is made, there will be many attempts at smuggling from abroad and modern conditions of transport will make it difficult to apply deterrent action unless a favourable state of mind is created in regard to this danger. It may be recalled that not long ago a woman radio star spoke on the B.B.C. and stated that one of her happiest experiences was observing men returning from Dunkirk smuggling a dog through at a port of disembarkation. We have found that this is no isolated sentiment and we are suggesting to the Ministry of Agriculture that they might take steps to enlist the co-operation of the Services and all interested civilians in discouraging this dangerous practice. Our recollection of the manner in which rabies was introduced into this country at the end of the last war makes us fear that there may be a repetition on a larger scale of such attempts to evade the law.

It is clear that if rabies enters our country it may be quickly spread owing to the large number of dogs now wandering about the military and other training camps and stated by the branches of the National Farmers' Union to be causing havoc among farm stock.

We trust that the matter will be very carefully considered by the veterinary profession and we need hardly say that this League will be glad to co-operate in any effort at enlightening the public mind as to the danger of such actions. The sufferings which were caused to dogs during the last rabies outbreak are painfully remembered by many dog owners and it is the League's earnest desire that they shall not be repeated through misplaced sentiment or sheer ignorance on the part of British or Allied men and women now in the Forces or the subsidiary services. We suggest that the public mind in this country should also be prepared, so that there may be greater vigilance in every section of the community.

Yours faithfully,
Charles R. Johns,
Secretary.

National Canine Defence League,
Victoria Station House,
London, S.W.1.
November 25th, 1942.

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N.V.M.A. ANNUAL MEETING AND CONFERENCE

Sir,—I thank you for your footnote to Mr. G. F. Brown's letter. The President's address fails entirely to answer the points raised in Mr. Brown's letter and my own.

The formation of the Veterinary Educational Trust was first disclosed in a reply by the President at the Mansion House. We are still in the dark as regards its origin and the various appointments already filled.

Schemes not duly considered, nor carefully discussed, are not going to justify our reservation. Mr. H. W. Steele-Bodger, in a recent paper, states, "A ca'canny policy is to be deprecated in time of peace, but in time of emergency it is not to be tolerated." A surprising statement, yet suitably answered by Mr. J. Edwards of West Byfleet, who writes, "Modern hectic times furnish many examples in many walks of life of attempts to get quick results—followed by disaster. . . . We should obviously take the long view and not allow any treatment of animals calculated to get quick result at the expense of health and long life. We ought to know that Nature cannot be hurried with impunity."

In this same paper Mr. Steele-Bodger remarks, "Certain it is that vaccination against abortion will have a more intensive *trial* under the Survey Scheme than ever before in this country." One wonders if the farmers know of this trial?

I am, Sir,
Yours faithfully,
J. E. Johnson.

Fieldhead,
Whickham,
Newcastle-upon-Tyne.
November 27th, 1942.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
Nov. 1st to 15th, 1942	17	49	—	53	12
Corresponding period in—					
1941 ...	8	1	—	9	18
1940 ...	27	14	—	22	239
1939 ...	20	3	—	10	225
Total Jan. 1st to Nov.15,1942	309	601	26	221	412
Corresponding period in—					
1941 ...	362	260	17	169	1,014
1940 ...	497	49	15	163	4,450
1939 ...	645	85	32	224	2,775

Note.—The figures for the current year are approximate only.
*Excluding outbreaks in Army Horses.